Case Report

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Internal Medicine Section

A Novel Approach for the Retrieval of Broken Catheter Fragment – Using Balloon Dilatation Technique

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ABSTRACT

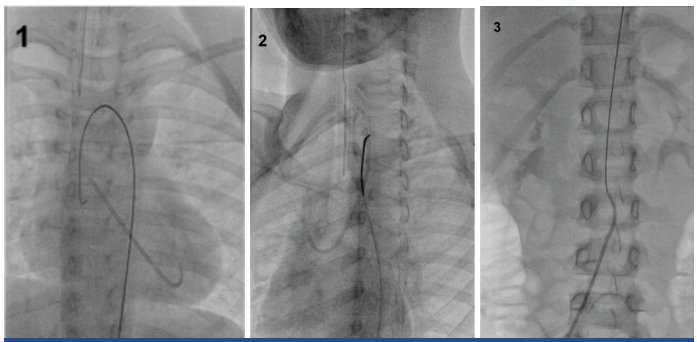
In this era of an ever increasing number of interventions in cardiology, there is a parallel increase in the number of complications associated with these interventions, such as broken catheter tip and guide wire embolisation. The most commonly used and effective method for the percutaneous retrieval of such broken fragments is a goose neck snare. However in cases where this technique has been a failure, newer and novel innovations have been implemented for the retrieval of such broken fragments. We present a case of seven-year-old female child with a 3mm peri-membranous ventricular septal defect who was taken up for device closure. During the procedure the internal mammary catheter was broken in the left ventricle and subsequently the broken fragment was embolised to the left common carotid artery. The broken fragment was snared down upto the common iliac but could not be retrieved out of the sheath. A novel approach was used, consisting of negotiating a coronary guide wire across the broken catheter and inflating a balloon in the catheter fragment which helped to achieve a co-axial alignment with the arterial sheath and hence by which it was possible to retrieve the broken catheter fragment out of the circulatory system.

Keywords: Common carotid artery, Embolisation, Foreign body, Ventricular septal defect

CASE REPORT

We present a case of seven-year-old female child who came with complaint of recurrent lower respiratory tract infections. On examination, her pulse rate was 100 per minute which was regular in character. Cardiovascular examination revealed hyperdynamic apex with a grade 3/6 pansystolic murmur in the left lower sternal border. Electrocardiogram was done which revealed equiphasic RS in V2-V3 suggestive of Katz-wachtel phenomena. Two-dimensional echocardiogram showed a 3 mm peri-membranous ventricular septal defect with large septal aneurysm and mild left atrial and ventricular dilatation. She was planned for device closure of the Ventricular Septal Defect (VSD) from the arterial side using AMPLATZER™ Duct Occluder II device (St. Jude Medical, Inc., USA).

After induction of general anaesthesia a right femoral artery and venous access was achieved. The peri-membranous VSD was profiled using a 5F pig tail injection into the left ventricle in the left anterior oblique (LAO) cranial view [Video-1]. The VSD was crossed from the arterial side using a 0.032 inch Terumo wire (Terumo Medical Corporation, New Jersey). While the Judkins right 5F catheter was being attempted to cross the VSD there was repeated prolapsing back of the catheter into the aorta. Hence for better support an Internal Mammary Artery (IMA) catheter was taken for crossing across the VSD. After few attempts at crossing the VSD it was noted that the distal part of the IMA catheter was broken and was floating inside the left ventricular cavity [Table/Fig-1]. This broken piece of catheter further embolised into the left common carotid artery spontaneously. Using a coronary (goose neck) snare through the right femoral artery, the broken catheter fragment was captured in the left common carotid artery [Table/Fig-2] and was pulled down into the right external iliac artery [Video-2]. However, the broken catheter piece could not be retrieved into the sheath as it was not placed co-axially with the sheath. Hence a coronary guide wire ASAHI Gaia (EPS Vascular AB, Sweden), of 0.014 inch was used and the wire was carefully negotiated across the lumen of the broken catheter distally [Table/Fig-3]. A 4 × 10 mm semi compliant balloon was taken over the wire and inflated to 10 atmosphere pressure. As it was a diagnostic catheter, the balloon could not be passed distal to the catheter. Hence the balloon was inflated inside the catheter such that the entire length of the balloon was embedded within the catheter and gentle traction was applied. This helped in achieving co-axial relationship with the sheath and the whole system was retrieved out without any vascular injury or compromise, hence avoiding major complication and the need for surgery [Video-3]. This technique turned out to be successful in retrieval of catheter without any dissection or vessel injuries.



[Table/Fig-1]: Antero – posterior view showing broken internal mammary artery catheter in the left ventricle.
[Table/Fig-2]: Left anterior oblique view showing capturing of the broken catheter fragment with the goose neck snare in the left common carotid artery.
[Table/Fig-3]: Antero-posterior view showing a carefully negotiated coronary wire (Gaia 0.014) across the lumen of the catheter.

DISCUSSION

Surgery has been the procedure of choice in patients with peri-membranous VSD. However, significant morbidity like bleeding, infection, residual shunts, atrio ventricular valve or aortic insufficiency, heart block, and neurologic problems are usually accompanied with surgery [1]. Consequently, transcatheter device occlusion has transpired as an alternative to surgery. But, VSD occlusion using metal devices is not devoid of risks. It has been complicated by aortic insufficiency, complete heart block, and device embolisation [2]. The VSD closure devices are placed with the help of one or more catheters. The catheters are prerequisite in various percutaneous interventions. There has been a massive rise in the number of interventions being performed. With escalating use of percutaneous interventions, the incidences and complications

arising due to intravascular foreign bodies have also been sky-scraping. Reports of intravascular foreign bodies include a variety of objects like stents, catheters, sheaths, wires, closure devices, etc [3,4]. The site of emplacement of such fragments or structures depends on the access site, catheter size and anatomy of the vascular system [5]. On the venous side, larger fragments may get lodged in the right ventricle and smaller fragment may embolise distally into the pulmonary circulation. Intra arterial fragments migrate distally more frequently as a result of blood flow [6]. Though the incidence of intra arterial broken catheters is high, retrieval of such broken fragments has been scarcely reported [7].

Intravascular foreign bodies which cannot be retrieved carry a morbidity and mortality rate of 71% [7]. Nevertheless, surgical retrieval carries high morbidity. Another approach on catheter fragmentation is conservative management using anticoagulants, leaving the fragment *in-situ*. However this approach has dual outcomes, with some reports of event-free survival and some with serious consequences [8]. Currently, percutaneous removal has become the procedure of choice as it is safe and associated with less morbidity. Various techniques are available for percutaneous removal of intravascular foreign bodies, namely: loop snare, proximal grab technique, distal wire grab technique, coaxial snare technique, lateral grasp technique, dormia baskets, small balloon catheter technique, etc [9]. Of the various techniques available, the loop snare method is most frequently employed. However, the loop snare technique may be at times unsuccessful either due to non availability of free ends or varying reasons that may lead to futile attempts [5,10].

Primarily, the balloon technique is advantageous in the retrieval of lost stents [11,12]. But at times, it is also applied for the retrieval of other structures such as catheters. In a previous study, 24 endovascular retrievals were performed. Of which, in fifteen (62.5%) procedures snare was utilised to remove the structure, two (8.2%) used balloon catheters, while other procedures are unknown. Both the cases that employed balloon catheters involved broken catheter fragments. Out of two procedures, only one was successfully retrieved while other was left at the place [13].

In the present case, initially the snare loop was used to retrieve the broken IMA catheter till the external iliac artery; however it was not possible to extrude it out of the sheath as it was not co-axial to the sheath. We used the balloon to fix the broken catheter fragment and make it co-axial for retrieval. Gupta et al., had earlier stated the importance of inflation of the balloon when it enters precisely half inside the broken catheter fragment, which specifically helps in appropriate alignment of the fragment with the proximal guiding catheter or sheath [14]. But in our case it was not sufficient to make it co-axial with the proximal sheath, hence the entire semi compliant balloon was advanced into the broken catheter and was subsequently inflated, and the whole system was gently retrieved with gradual pull back into the sheath. Passing the balloon distal to the catheter was not possible as it was a guiding catheter. Thus, passing of the micro guide wire through the lumen of the catheter distally is an important step in the process. The wire helps in stabilizing the broken catheter fragment so that the balloon can be easily passed onto it. This technique may be at a disadvantage sometimes if the operator is unable to pass wire through the lumen of the broken catheter. Moreover, the fragments sporadically throw up jeopardy of additional vascular trauma, coronary spasms, or new fragmentation [15]. However in our case, there was a successful retrieval of catheter without any dissection or injuries. Thus, this case corroborates that the applied combination is safe and effective for the retrieval of broken catheter fragments.

CONCLUSION

The broken catheter fragment was successfully retrieved without any complications. Therefore, this case substantiates that the aforementioned combination can be applied for safe and effective retrieval of broken catheter fragments.

REFERENCES

[1] Sideris EB, Sideris CE, Stamatelopoulos SF, Moulopoulos SD. Transcatheter patch occlusion of experimental atrial septal defects. *Catheter Cardiovasc Interv*. 2002;57(3):404-07.
[2] Sideris EB, Macuil B, Varvarenko V, Toumanides S. Transcatheter patch occlusion of perimembranous ventricular septal defects. *Am J Cardiol*. 2005;95(12):1518-21.
[3] Tateishi M, Tomizawa Y. Intravascular foreign bodies: danger of unretrieved fragmented medical devices. *J Artif Organs*. 2009;12(2):80-89.
[4] Gabelmann A, Kramer S, Gorich J. Percutaneous retrieval of lost or misplaced intravascular objects. *AJR Am J Roentgenol.* 2001;176(6):1509-13.
[5] Bloomfield DA. Techniques of nonsurgical retrieval of latrogenic foreign bodies from the heart. *Am J Cardiol.* 1971;27(5):538-45.
[6] Koseoglu K, Parildar M, Oran I, Memis A. Retrieval of intravascular foreign bodies with goose neck snare. *Eur J Radiol.* 2004;49(3):281-85.
[7] Rubinstein Z, Morag B, Itzchak Y. Percutaneous removal of intravascular foreign bodies. *Cardiovasc Intervent Radiol*. 1982;5(2):64-68.
[8] Porwal SC, Modi R, Patted SV, Halkatti PC, Thakkar A, Sarang A. Successful non-surgical management of entrapped hydrophilic guidewire during percutaneous coronary intervention. *Interv Cardiol.* 2014;6(5):411-14.
[9] Woodhouse JB, Uberoi R. Techniques for intravascular foreign body retrieval. *Cardiovasc Intervent Radiol*. 2013;36(4):888-97.
[10] Marlon AM, Cohn LH, Fogarty TJ, Harrison D. Retrieval of catheter fragments. Report of two cases. *Calif Med*. 1971;115(5):61.
[11] Brilakis ES, Best PJ, Elesber AA, Barsness GW, Lennon RJ, Holmes DR, et al. Incidence, retrieval methods, and outcomes of stent loss during percutaneous coronary intervention: A large single-center experience. *Catheter Cardiovasc Interv*. 2005;66(3):333-40.
[12] Cishek MB, Laslett L, Gershony G. Balloon catheter retrieval of dislodged coronary artery stents: a novel technique. *Cathet Cardiovasc Diagn*. 1995;34(4):350-52.
[13] Carroll MI, Ahanchi SS, Kim JH, Panneton JM. Endovascular foreign body retrieval. *J Vasc Surg*. 2013;57(2):459-63.
[14] Gupta A, Purkayastha S, Krishnamoorthy T. Percutaneous retrieval of intravascular broken catheter fragments. A novel technique using a balloon. *Interv Neuroradiol*. 2005;11(2):149-54.
[15] Al-Moghairi AM, Al-Amri HS. Management of retained intervention guide-wire: A literature review. *Curr Cardiol Rev*. 2013;9(3):260-66.

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